

Transformer Bushings Monitoring

complex system



integrated



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Pioneering the future of power testing and monitoring



Proven BMC technology

The same Bushing sensors and components are used in the SIEMENS Bushing monitoring system



Key advantages

- Simultaneous measurement of up to six bushing leakage currents, providing following data:
- Relative capacitance in percentage to the start-up value
- Relative power factor (%PF) for each bushing
- Magnitude of imbalance currents for two three phase sets of bushings
- Phase angles of the imbalance currents
- Alarm in case the measured values exceed the threshold
- Complete on-line transformer monitoring and bushing monitoring system in conjunction with other POWER VIEW products

Description

Bushing are relatively cheap (comparing to transformer value). Unfortunately, bushings breakdown failure often leads to catastrophic transformer failure like windings deformations. Due to materials imperfection weather conditions and stress bushings are prone to failure. Unfortunately, sometimes that failure escalates very quickly. Historically bushings were tested off-line to measure the capacitance and the dissipation / power factor.

The Bushing BMC Monitor is a permanently installed on-line bushing monitoring system. It continuously measures up to six leakage currents, tests the power factor and capacitance values and monitors the condition of bushings, CCVT's 1) and free-standing CT's.

The bushing monitoring system incorporates three measurement modes for standard and two for optional configurations. Standard configuration with 6 current inputs:

- Sum of three current test
- Adjacent phase reference test
- Phase comparison

Optional configuration with 3 voltage and 3 current inputs:

- Reference test (3 bushings and 3 CCVT's 1))

Optional configuration with 6 voltage inputs:

- CCVT 1) Reference test (6 CCVT's 1))

The bushing sensors / adapters are connected to the capacitor taps designed for all types of bushings to allow measurement of the leakage current up to 140 mA AC.



Advanced reporting

Most advanced reporting and communication protocols



Bushing monitoring setup

The Bushing Monitoring system POWER VIEW BLC Monitor can be ordered in different versions with 3, 6, 9 2), 12 2) or 16 2) bushing sensors according to the specification.

The system contains following parts:

- Bushing sensors with connection cable
- Bushing Monitor Power View BLC including cabinet, power supply, circuit breaker, terminals and wiring
- Communication cable

The adapters are designed for bushings with grounded and un-grounded capacitor taps. The adapter is designed to prevent a voltage developing on the equipment, in case that the sensor becomes disconnected from the bushing monitoring system.



Transformer Bushing Monitoring with PD



Key advantages PD

When the utmost in transformer reliability is required for critical transformer assets, partial discharge detection must be part of the monitoring strategy.

The POWER VIEW BLC Monitor PD plus performs all the test methods of the POWER VIEW BLC Monitor but also monitors for partial discharge (PD). The PD activity in the bushings is monitored in parallel with the power factor calculations.

PD is detected using the same bushing sensor as with the POWER VIEW BLC Monitor, there are no other sensors or Rogowski coils.

PD is caused by defective insulation in high-stress areas, movement of energized parts, or design errors where low level discharges occur.

Some types of PD may not present a problem, but others can develop into surface tracking or insulation failure, which can lead to bushing or transformer failure.

The POWER VIEW BLC Monitor PD plus also has the unique capability of monitoring GIC events and trends which potentially could damage the transformer.



Additional Specifications POWER VIEW BLC Monitor PD plus

Power Supply Input	85-264 VAC, 120-370 VDC, 50 VA
Operating Range	
PD Frequency HF	<20 MHz
PD Resolution	1.0°
Time Resolution	10 nS
Dynamic Range	65 dB
PD Intensity	0 – 5000 mW
PD Amplitude	0.02 – 100 nC ± 10 V

- Top oil temperature sensor input
- Three load current CT sensor inputs
- Ambient Temperature and Humidity sensor inputs

Outputs

- PF, C1, leakage current for each bushing
- Imbalance for each group of 3 bushings
- PD power, PD amplitude, PD pulse count for each channel
- PRPD plots for each channel
- Top oil temperature
- Load currents
- Hot-Spot temperature
- Ambient temperature and humidity



Measurements		Accuracy
Measuring quantity	Range	
Leakage current	0 ... 140 mA AC	± 1.5 % of reading
Power factor / Dissipation factor	0 ... 100 %	± 0.045 % absolute
Capacitance	100 ... 5000 pF	± 1.0 % of reading
Phase angle of imbalance current	0 ... 360	± 1.0 % of reading

Digital outputs

- Bushing sensor - Resistive bridge / capacitive bridge

Communication

- **RS 232 – Screw terminals and RJ45 (Proprietary protocol) Communication interface**
- DNP3 serial or MODBUS® RTU Controller (Option)

Operation principle

- Bushing sensor - Resistive bridge / capacitive bridge

Supply voltage	85 ... 264 V AC / 47 ... 63 Hz or 120 ... 370 V DC
Power consumption:	Max. 24 VA
Dimensions:	
Cabinet:	Stainless steel 304
3 and 6 channels	W 420 x H 595 x D 153 mm
9 and 12 channels	W 610 x H 686 x D 229 mm
Weight:	
3 and 6 channels	approx. 15 kg
9 and 12 channels	approx. 23 kg
Operation temperature:	-40 °C ... +65 °C
Storage temperature:	-40 °C ... +85 °C
AD converter	16 Bit
Sampling rate	10 kHz
Safety	
Electrostatic discharge:	IEC 801-2

Voltage range: (Bushing primary)	69 ... 765 kV AC
60 Hz voltage: (on the tap at monitoring)	max. 2.5 kV AC
60 Hz voltage: (on the tap at opened or mistakenly cut coax cable)	max. .5 kV AC
Dimensions:	Size is different depending on the voltage
Weight:	approx. no more than 1 kg
Operating temperature:	-55°C ... +90°C, 95 % relative humidity (non condensing)
Storage temperature:	-50 °C ... +55 °C
Installation environment:	Outdoor, no corrosive agents in the air
Type of capacitor tap:	Any manufacturer
Connector to test tap:	¾" / 1 ¼" / 2 ¼" others on request

Transformer Bushing Monitoring with PD

Technical Specification

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